

ECR 2010 Vienna

Imaging features of small bowel and colorectal cancer in inflammatory bowel disease



L. Hristova, V. Laurent, O. Bruot, P. Ganne, J. Mathias, D. Regent; *Vandoeuvre-les-Nancy/FR*

Learning Objectives

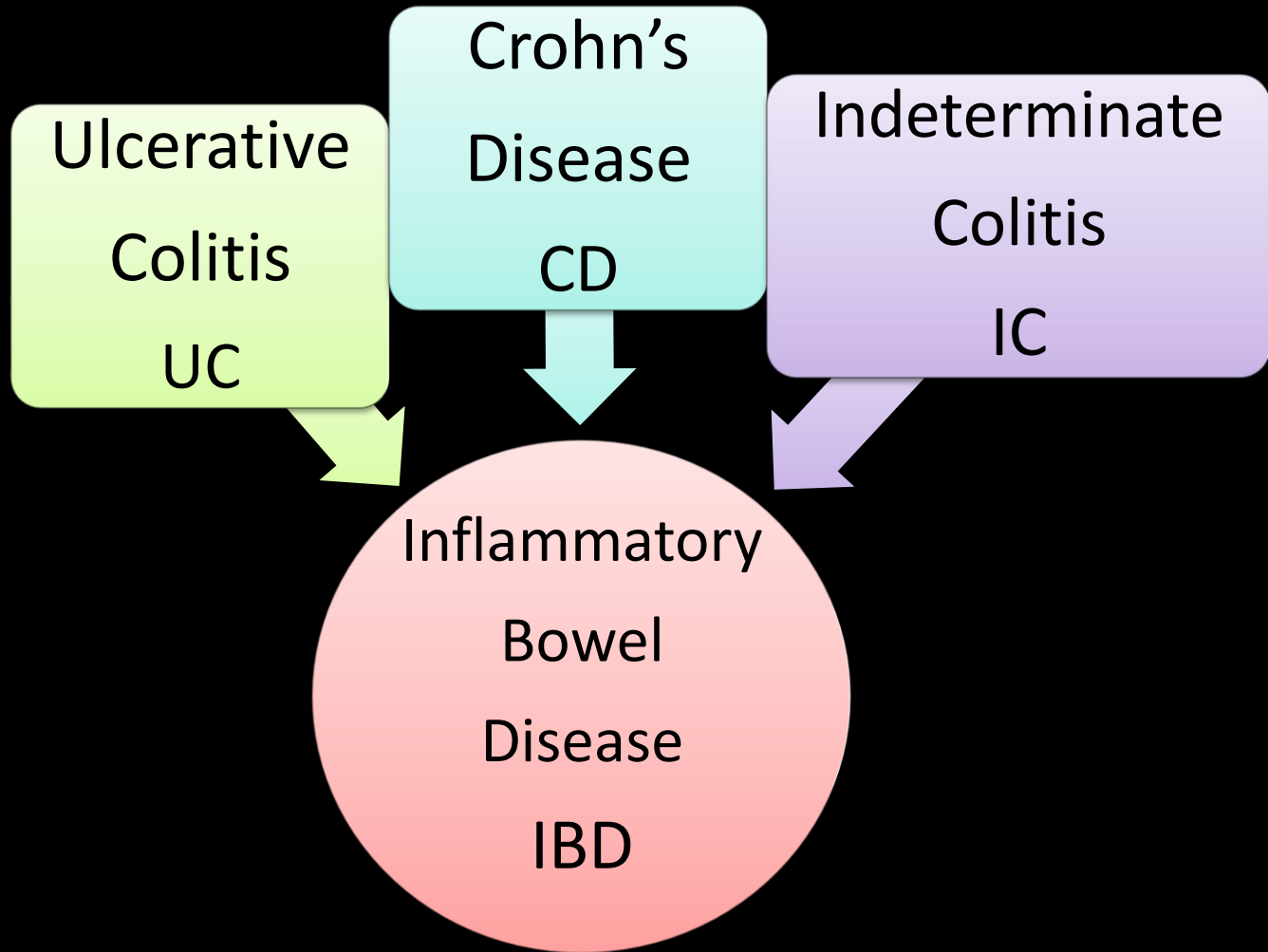
- To know the risk factors for developing small bowel cancer (**SBC**) and colorectal cancer (**CRC**) in patients with inflammatory bowel disease (**IBD**)

- To know the clinical and pathological features of CRC and SBC in patients with IBD

- To illustrate the imaging features of small bowel and colorectal malignancy in IBD

- To emphasize the difficulty in establishing a diagnosis

Background



Patients with IBD have **increased risk** for developing colorectal and small bowel cancers.

The **prevalence** of CRC in patients with UC is approximately **3.7%** overall and 5.4% for those with pancolitis (1).

The prevalence of CRC in Crohn's colitis is similar(2).

Patients with CD have **relative risk 28** for developing small-bowel cancer compared to the background population (3).

No increased risk was found in stomach and anal cancer in patients with IBD (4,5).

Risk factors for CRC in patients with IBD

Duration of Disease

The risk of CRC becomes greater than that of the general population after 8 to 10 years from the onset of disease (1).

The cumulative incidence of CRC is 2.5% after 20 years of IBD, 7.6% after 30 years and 10.8% after 40 years (7).

Anatomic extent

UC: the standardized incidence ratio (SIR) for CRC increase gradually from 1.7-fold in proctitis, 2.8-fold in left-sided colitis to **14.8-fold in pancolitis**, compared with age-matched population without UC (8).

CD: the risk of CRC is increased when the extent of the **colic involvement is greater** than one third(7).

Primary Sclerosing Cholangitis

The **concomitant** presence of **PSC** in IBD patients confers a high risk for developing colorectal cancer(9,10).

The cumulative incidence of CRC in UC patients was 33% at 20 years (10).

When **liver transplantation** is necessary, prophylactic colectomy should be considered(11).

Young age at onset

- Young age at onset, when younger than 25, increases the risk of developing CRC(1)
- When onset is after 30 there is no increased risk of CRC

Family history of CRC

- Family history of sporadic CRC increases twice the risk of CRC(13)

Degree of endoscopic and histologic activity

- The increased severity of inflammation correlates with increased frequency of dysplasia(7)
- Patients with longstanding quiescent colitis remain at risk for developing CRC

Screening colonoscopy

*Consensus Conference 2004 by Crohn's and Colitis
Fondation of America CCFA (6)*

Screening colonoscopy should begin in patients with IBD:

8-10 years after the onset of IBD symptoms



1. UC pancolitis or left-sided colitis
2. Crohn's colitis involving at least one third of the colon
3. At onset of PSC if associated

Clinical and pathological features of colorectal cancer in IBD

Age at diagnosis

- 10 year earlier then in sporadic CRC
- UC: The mean age is 52 years (14)
- CD: the mean age is 54 years(15)

Anatomical Location

- Tumor occurs in area of macroscopic disease
- CD: tumors occurs in ileocaecal and rectosigmoid regions
- UC: from the rectum to the right-sided colon (15)

Histology

- Frequency of mucinous and signet ring cell tumor is higher then in general population(15)
- Synchronous tumor locations

Risk factors for SBC in patients with Crohn's Disease

The relative risk of small bowel carcinoma in CD seems to be 28.4 times higher compared to general population (3).

Duration of disease

- Essential factor
- The mean duration of CD is 19 years (3)

Anatomic extent

- Distal jejunal and ileal location (16)

Young age at onset

- When younger than 25 years at onset of CD

Complications

- Strictures
- Chronic fistulous disease
- Small bowel bypass loops

Clinical and pathological features of SBC in CD

Age at diagnosis

- The median age of diagnosis is **48 years** versus 65 in general population(16)

Anatomic location

- The highest incidence in the **distal jejunum and ileum**: area of macroscopic disease

Histology

- Adenocarcinoma with signet ring cell is frequent: up to one third (17)

Patients and materials

The computerized medical record system Explore in the PACS at the Radiology department of the University Hospital of Nancy was used to identify patients with **IBD and concomitant SBC or CRC**.

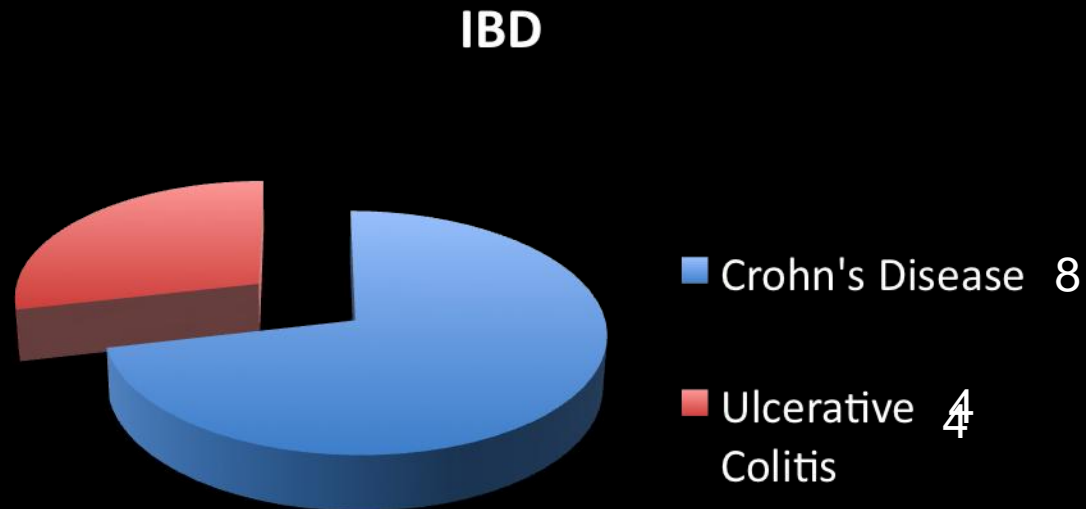
The diagnosis of IBD, CRC and SBC were confirmed by clinical, imaging, endoscopic and histological criteria.

Only patients who had a **scanner or magnetic resonance** were accepted.

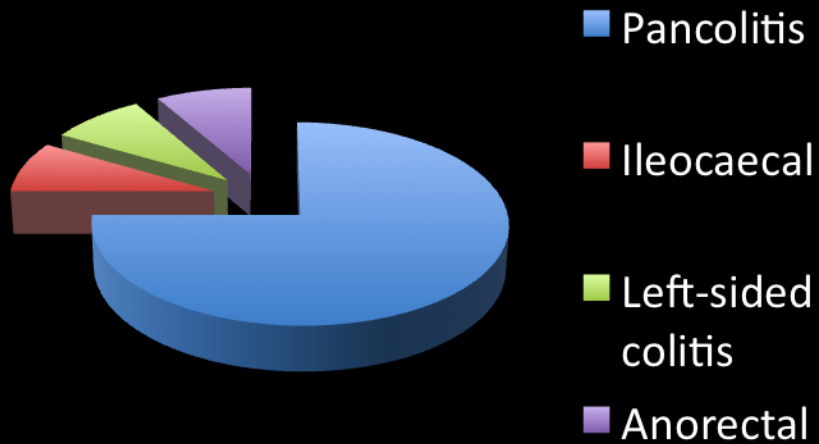
There were 15 patients with both, IBD and CRC-12 or SBC-3, between 2001 and 2009.

There were 12 patients with IBD and concomitant **colorectal cancer**.

8 of them had Crohn's disease and only 4 had Ulcerative Colitis.

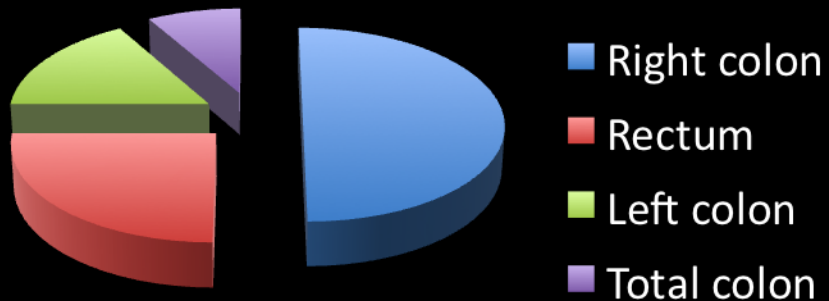


Location IBD



75% of the patients with CRC had severe **pancolitis**.

Location CRC

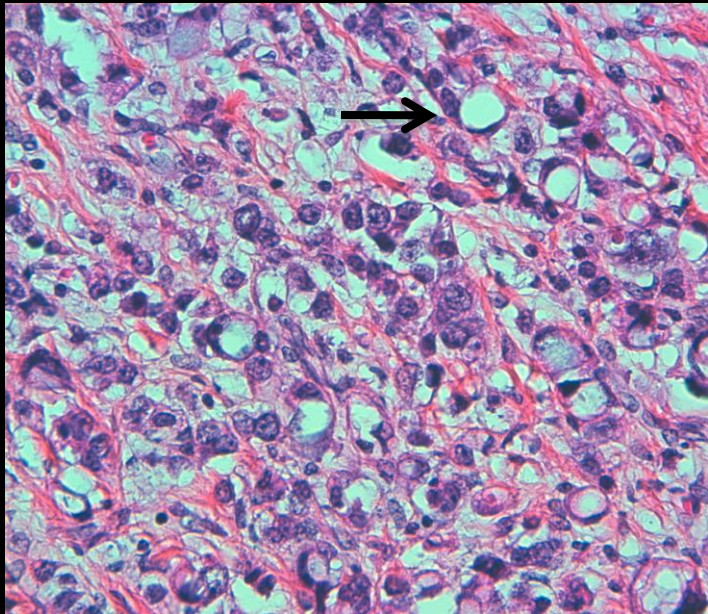


40% of the CRC were located in the **left colon**.

Histology CRC

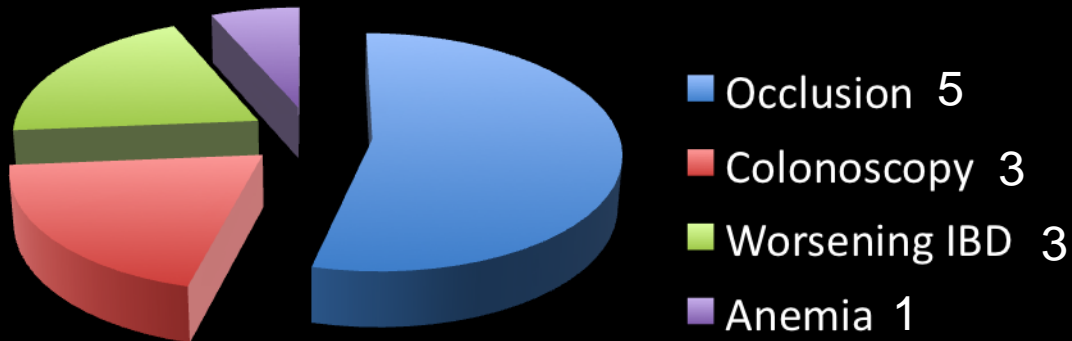


42% of CRC were with Signet Ring Cell component. CRC with signet ring cell are only 1% of CRC in general population.



*Histological aspect of colic adenocarcinoma with signet ring cell component. This is a **signet ring cell** pattern of adenocarcinoma in which the cells are filled with mucin vacuoles that push the nucleus to one side, as shown at the arrow.*

Clinical presentation of CRC



Only 3 (25%) of CRC were discovered by screening colonoscopy.

Five (42%) of CRC presented an occlusion. Three (25%) had worsening of the IBD and one had anemia.

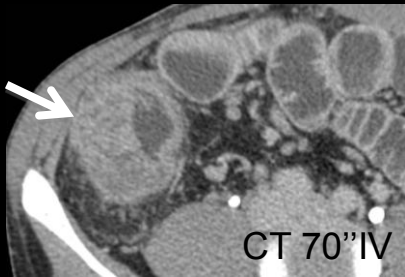
In these 5 cases of CRC presenting as occlusion the pre operative diagnosis of neoplasia was **not suspected**. The imaging findings indicated an **inflammatory benign stenosis**.

Patient 1

CT 02/2009



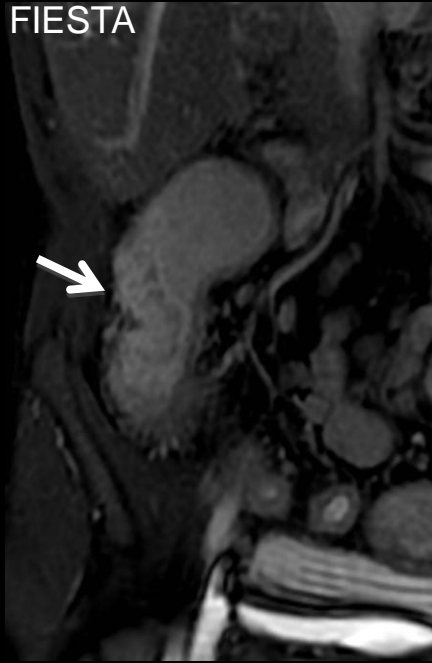
CT 70"IV



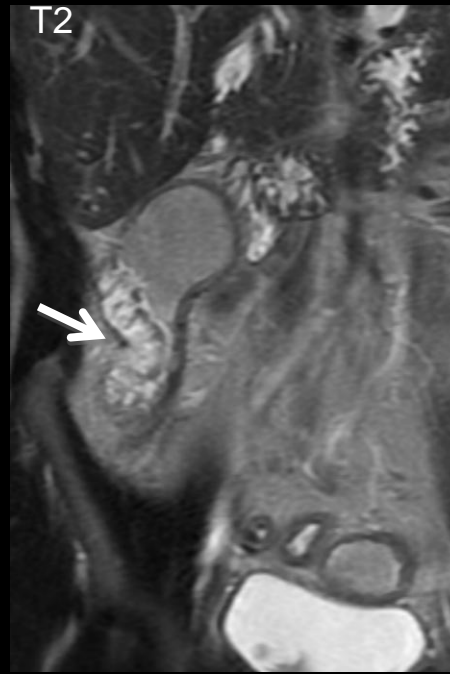
CT 70"IV

MR 02/2009

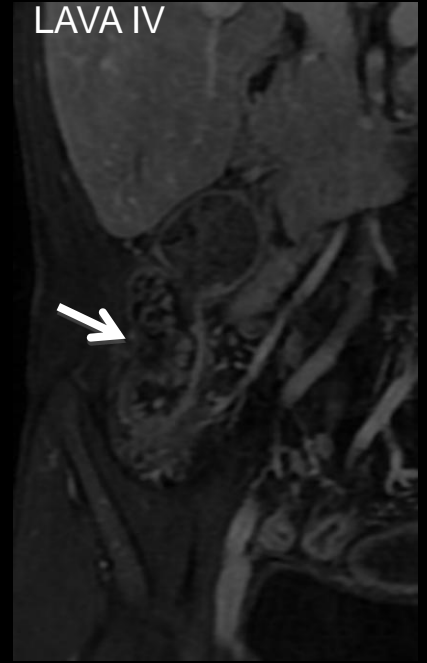
FIESTA



T2



LAVA IV



39 year-old man with ileocecal CD from 26 years and PSC with liver transplantation 8 years ago. Refusal of screening colonoscopy. CT and MRI realized for worsening of the CD with inefficient medical treatment.

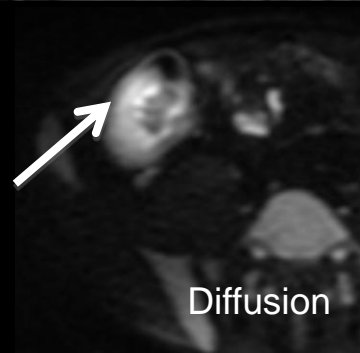
Asymmetric wall thickening of the right colon with a parietal mass. Hyperintense asymmetric mass in T2 weighted images related to hydric mucinous component. Poor and late enhancement after gadolinium IV administration relegated to the fibrous tumor. Pericolic spiculations in the peritoneal fat and positive ganglia on histology.

Surgery- **Mucinous adenocarcinoma** pT4N1M0

T1 Gd FS



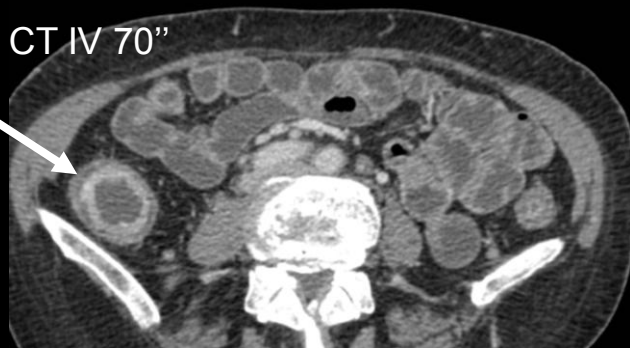
Diffusion



Patient 2

CT 12/2007

CT IV 70"



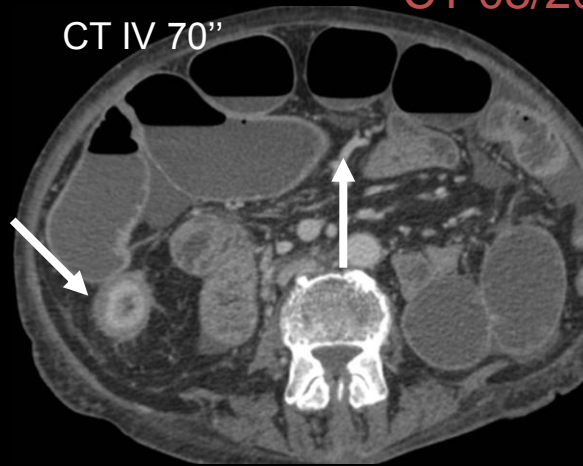
CT IV 70"



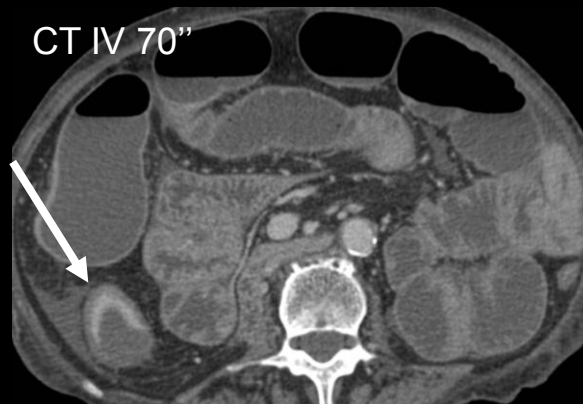
58 years old female with CD from 2 years and long history of digestive disorder. Pancolitis and difficult medical treatment, right-sided colon stenosis.

CT 08/2009

CT IV 70"



CT IV 70"



CT IV 70"



CT IV 70"



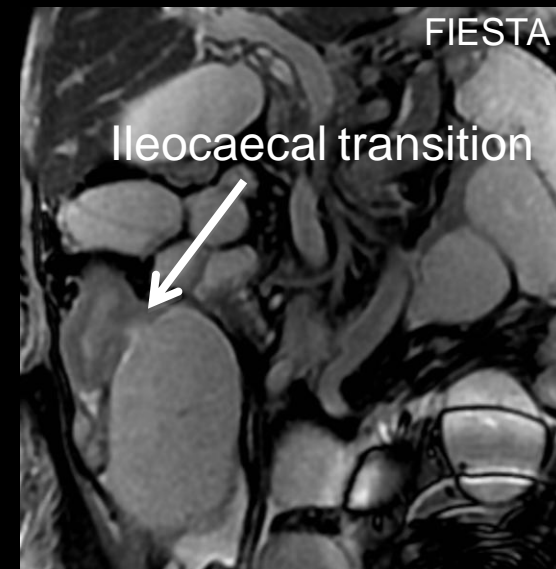
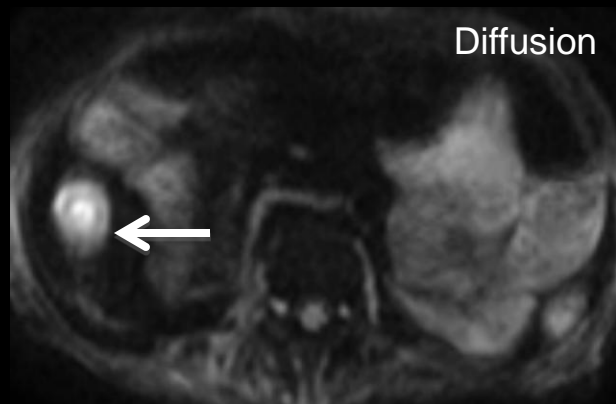
Same patient 2 years later: 60 years old. Small bowel occlusion resistant to medical treatment since 2 months and lost of 2 kg.

2 years later. Stenosis and right-sided colitis responsible for small bowel occlusion. The stenosis was present in 2007.

Ileocaecal surgical resection: **adenocarcinoma with signet ring cell: T4N2M0.**

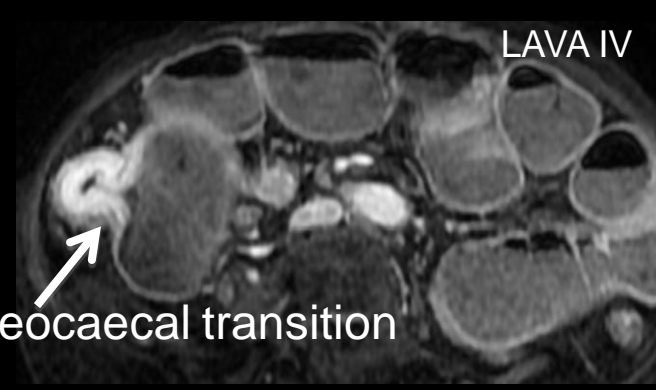
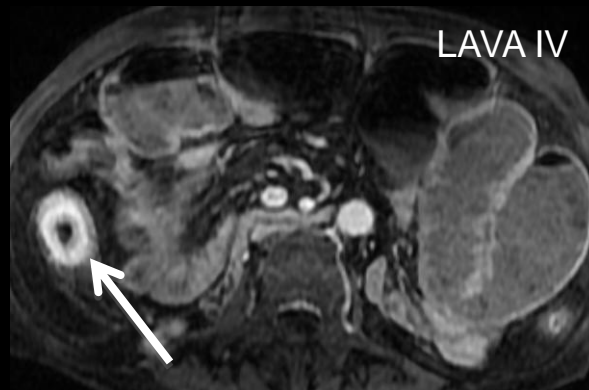
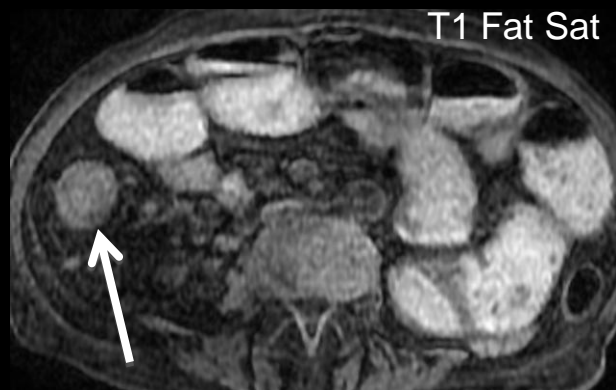
Patient 2

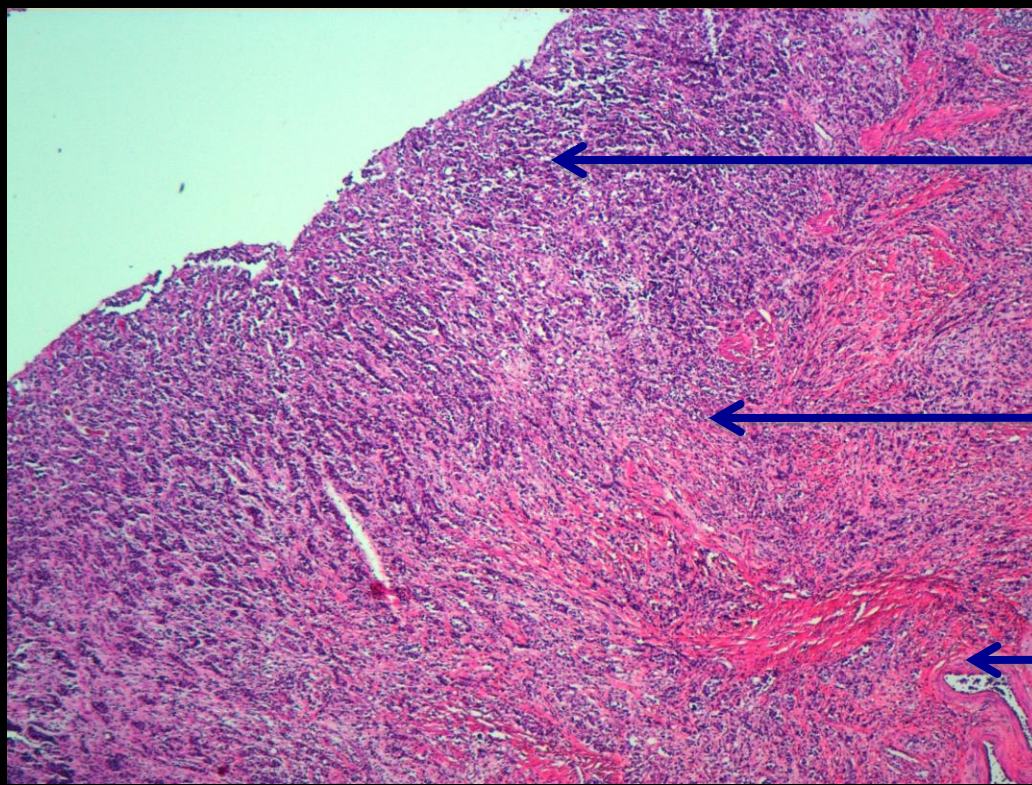
MRI 08/2009



Same patient. Right-sided colitis and stenosis. Regular stenosis without fistula or abscess. Small bowel occlusion. Hypersignal in Diffusion: active colitis. Intense mucosal and submucosal enhancement without any superficial ulceration.

Diagnosis: inflammatory right colon symmetric stenosis and small bowel occlusion.



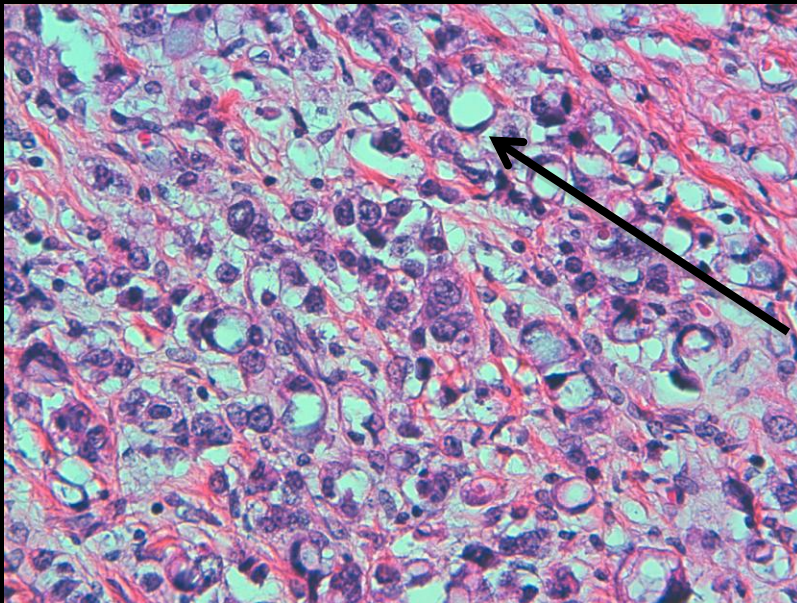


Mucosa: important tumor (signet ring cell) infiltration

Submucosa: intense tumoral infiltration

Muscularis: poor tumoral infiltration

Rich vascularisation:
neo-angiogenesis



Same patient: Ileocaecal surgical resection:

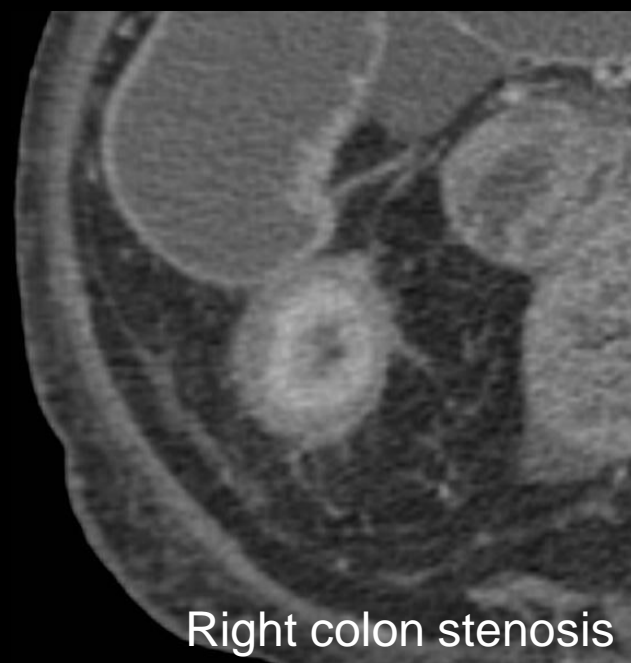
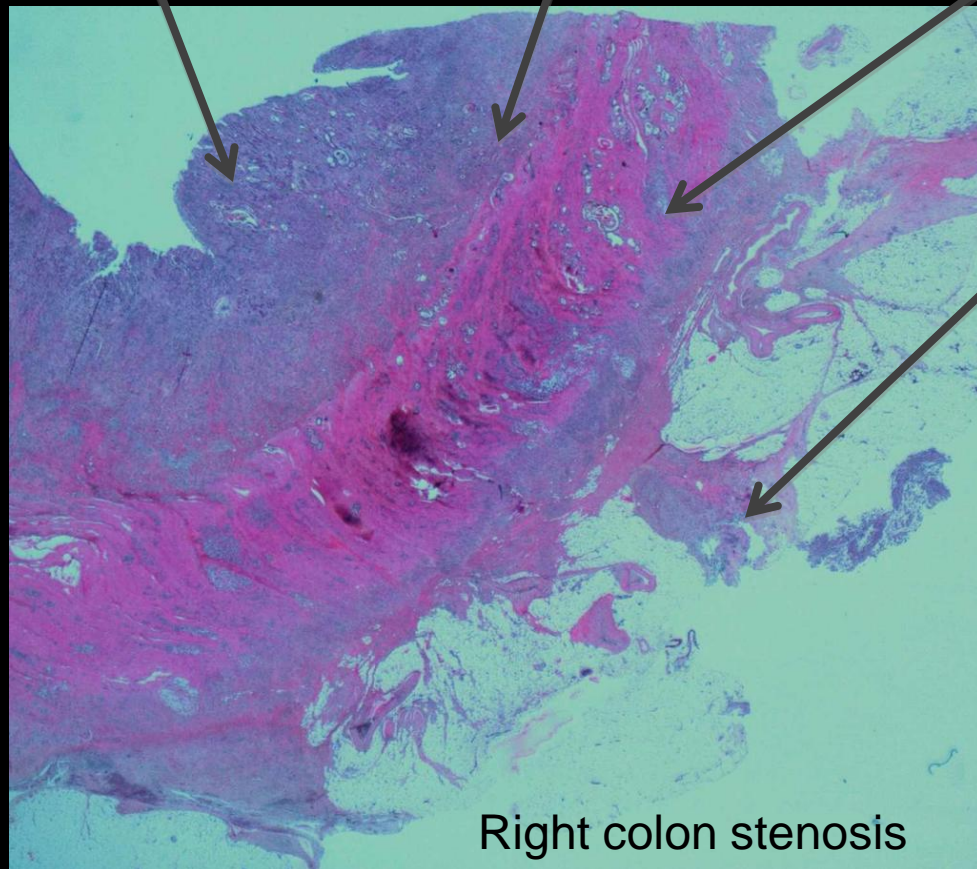
Adenocarcinoma with signet ring cell component: T4N2M0. Signet ring cell infiltration of all colic layers and positive boards of resection

Mucosa: important tumor (signet ring cells in blue) infiltration

Submucosa: intense tumor infiltration

Muscularis: poor tumor infiltration (blue) and disorganization

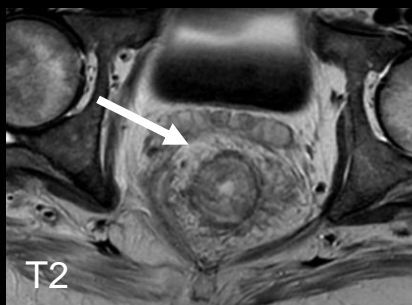
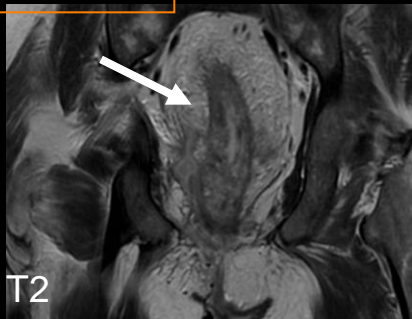
Pericolic fat: tumor infiltration



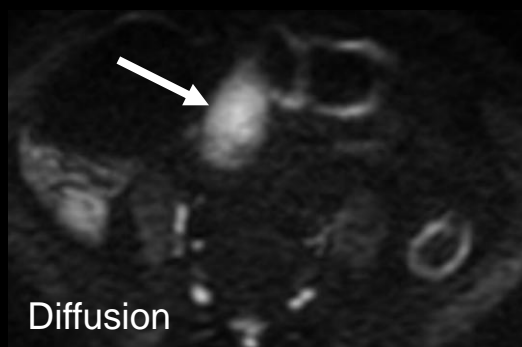
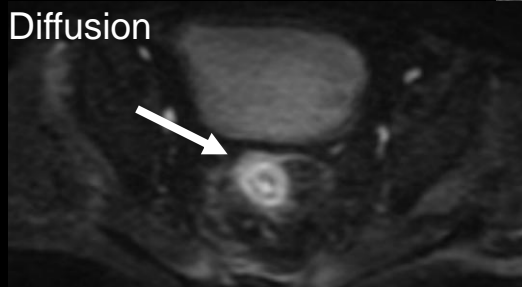
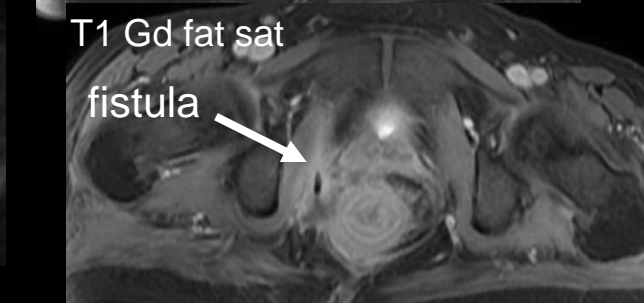
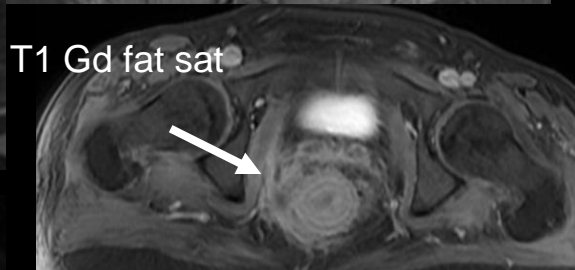
Same patient: **Adenocarcinoma with signet ring cell T4:** the signet ring cells infiltrate all layer of the colic wall and disorganize its structure. The enhancement of the inner layer corresponds of the tumor and its vessels.

Patient 3 MRI 10/2008

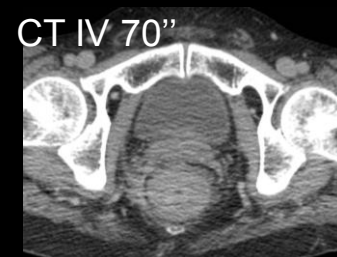
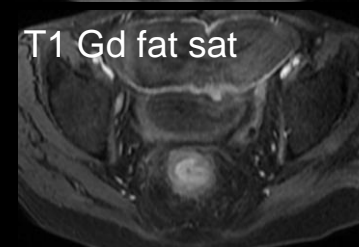
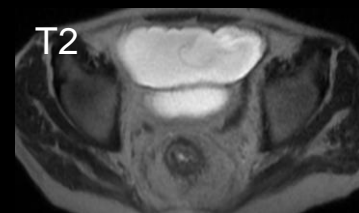
42 years-old man with CD from 15 years. Rectosigmoiditis and anal fistula, difficult medical treatment. Transverse colostomy of discharge.



Severe rectosigmoiditis with submucosal edema in hypersignal T2, important enhancement of all layers of rectosigmoid and hypersignal in Diffusion. Complex anal fistula at 10h.



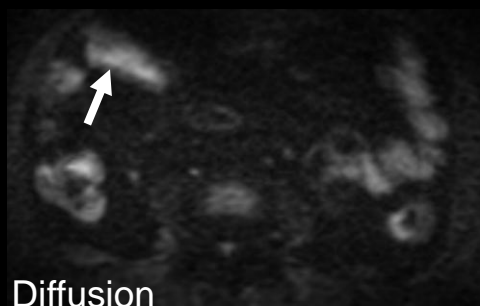
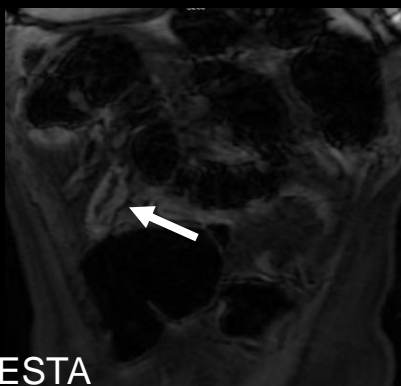
MRI & CT 03/2009



Same patient 5 months later. Severe rectosigmoiditis and anal lesion. Small bowel occlusion though the transverse colostomy.

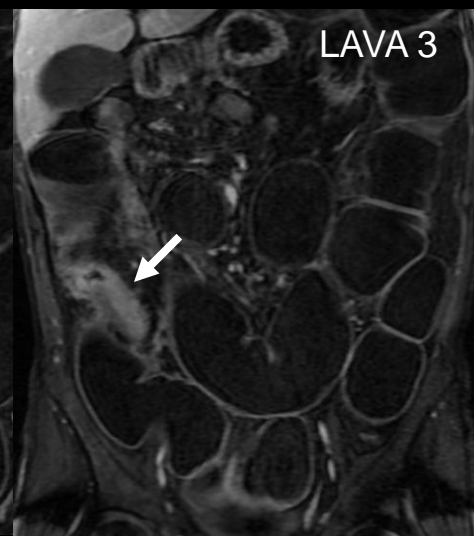
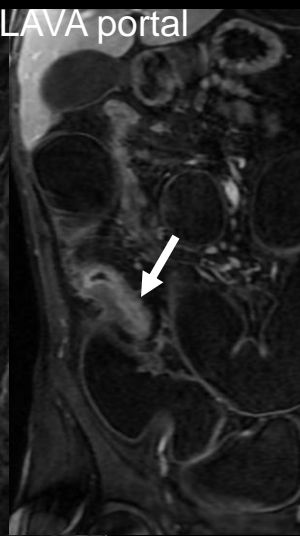
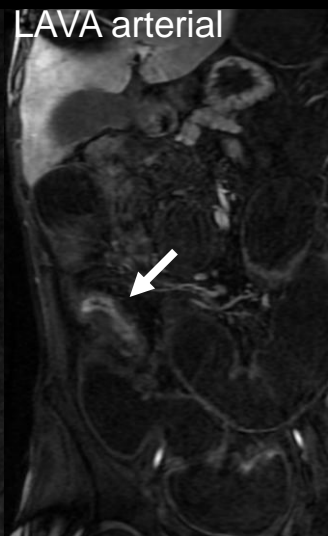
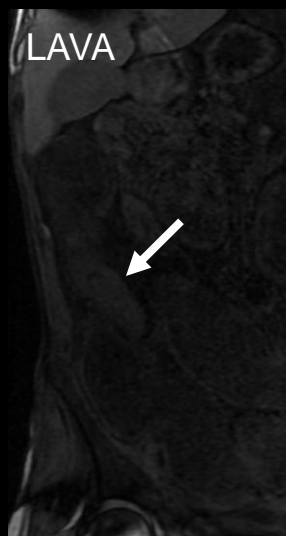
Patient 3

MRI 10/2008



Same patient. Small bowel occlusion though the transvers colostomy.

MRI 03/2009

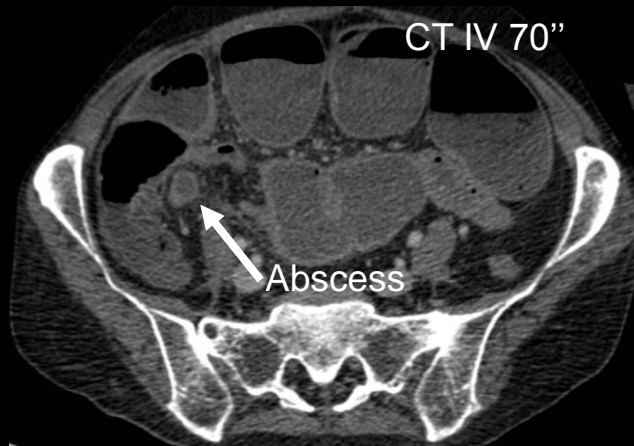
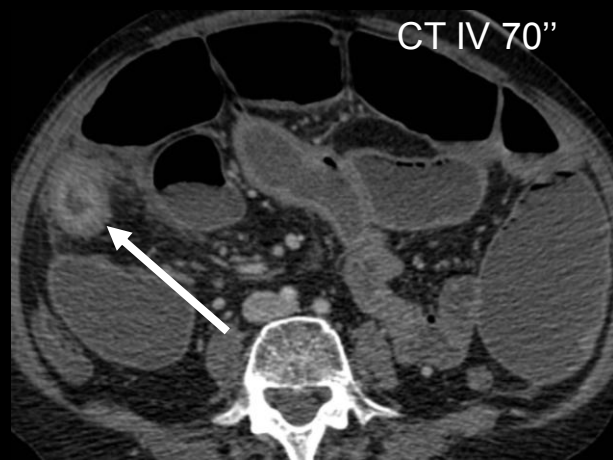


The aspect of the ileitis in the beginning of the rectosigmoiditis.

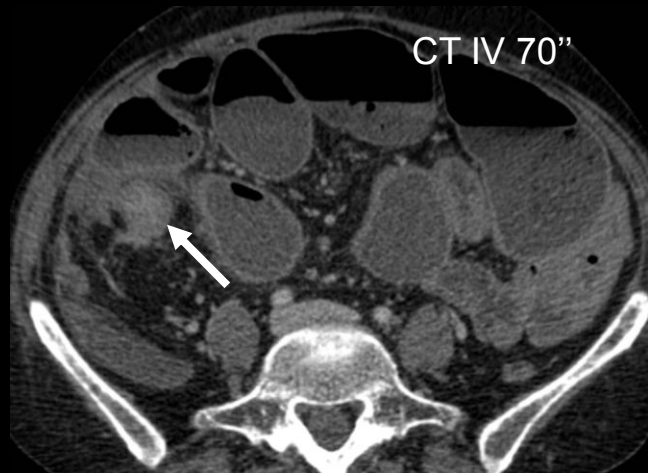
Small bowel occlusion due to an ileum inflammatory symmetric stenosis with progressive beginning, infiltration of adjoining fat.

Patient 3

CT 03/2009



Same patient.



Small bowel occlusion due to an ileum inflammatory circumferential stenosis. Important infiltration in the periileal fat. Little abscess. Ileitis with intense enhancement of the inner layer.

Ileo-colic total resection: **adenocarcinoma with signet ring cell** component spread out from ileum to the rectosigmoid and the anus, except the transverse colon.

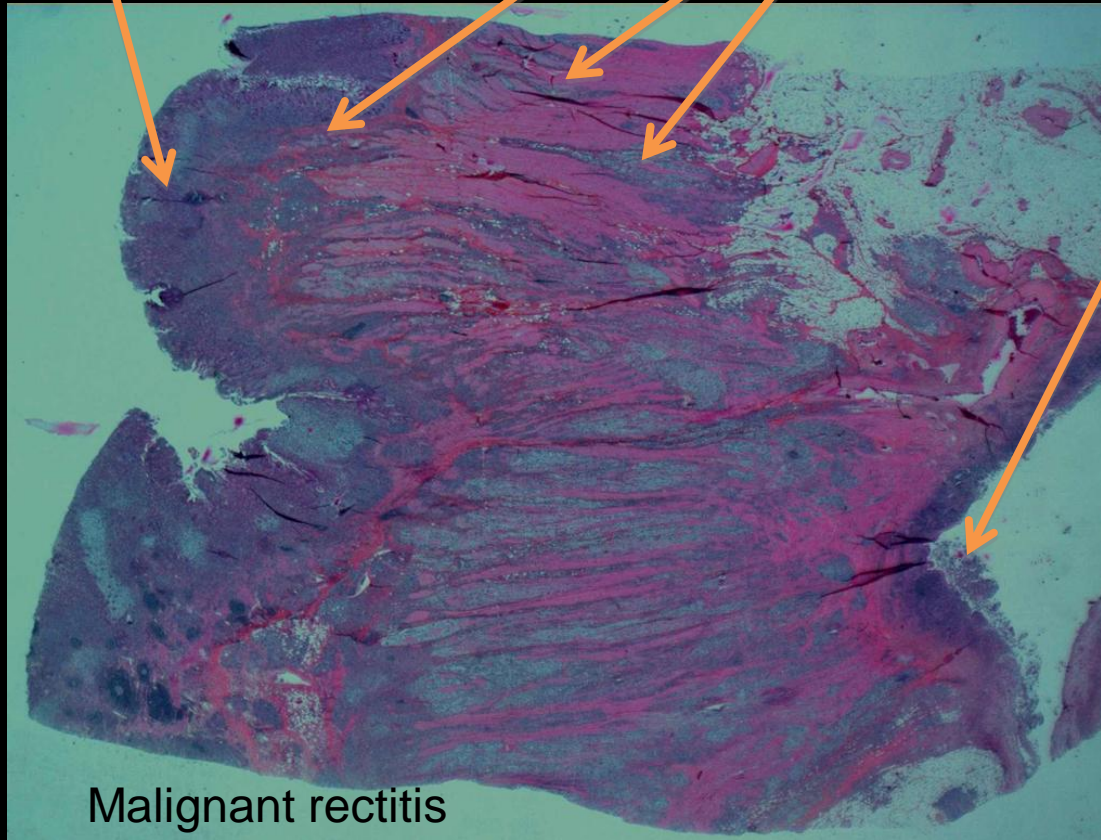
T4 N2 M1

Mucosa: important tumor (signet ring cells) infiltration

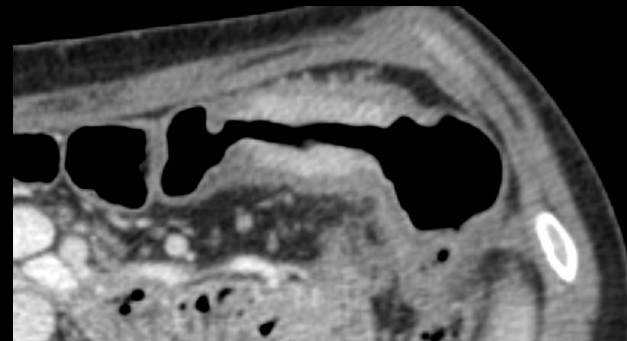
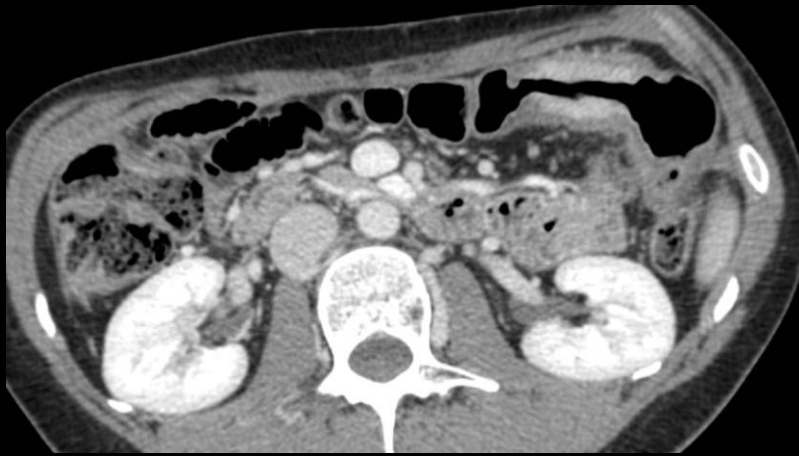
Submucosa: intense tumor infiltration

Muscularis: intense tumoral infiltration (in blue) and disorganization

Pericolonic fat: tumor infiltration



Same patient: Adenocarcinoma with signet ring cell T4 spread out from **ileum** to the **rectosigmoid and the anus**, except the transverse colon. The signet ring cells infiltrate all the layers, the inner layer is thin, the muscularis is very infiltrated and thick.



*31 years old female, CD from 14 years.
Adenocarcinoma with signet ring cell right-
sided colon 3 years ago diagnosed with
small bowel occlusion and perforation.*

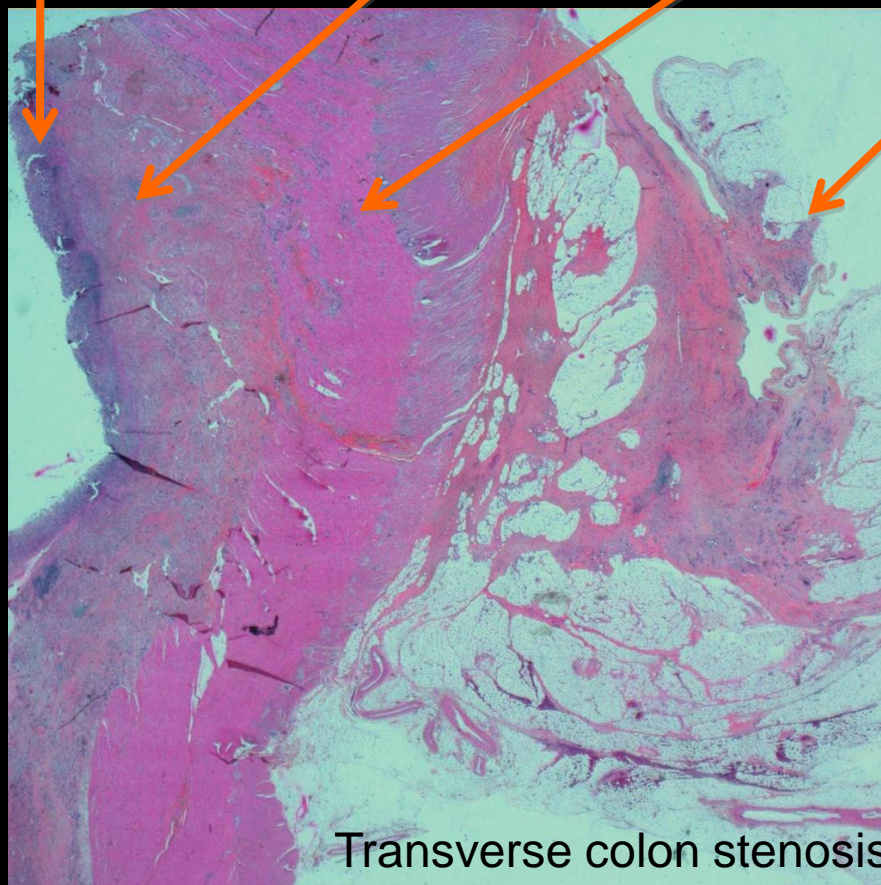
Recidivism of the colic **adenocarcinoma with signet ring cell** in the transverse colon. Symmetric stenosis without mass. Intense enhancement of the inner layer without ulceration or abscess.

Mucosa: important tumor (signet ring cells) infiltration

Submucosa: intense tumor infiltration

Muscularis: poor tumor infiltration

Pericolic fat: tumor infiltration

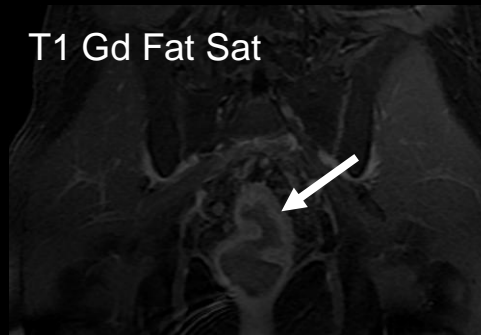
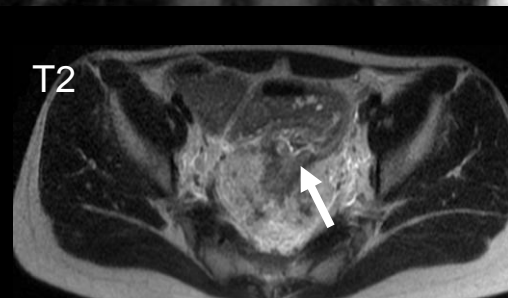
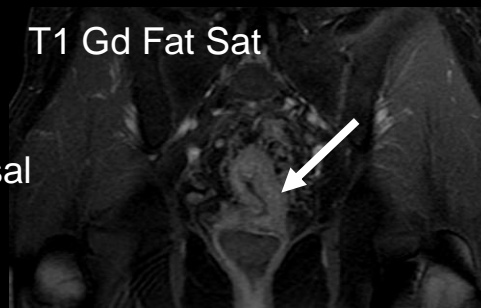
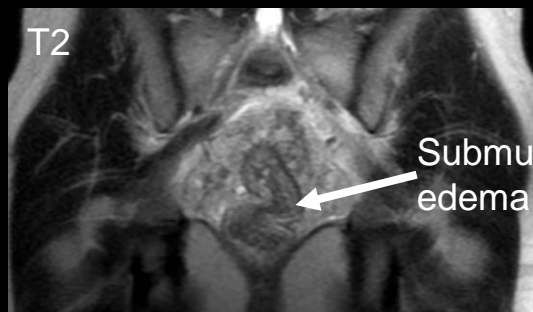
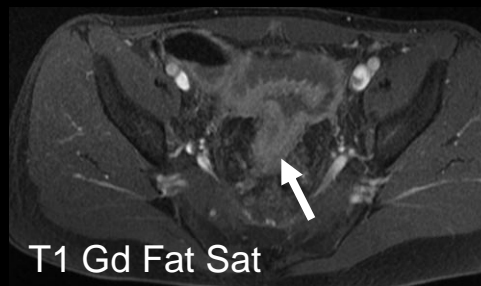
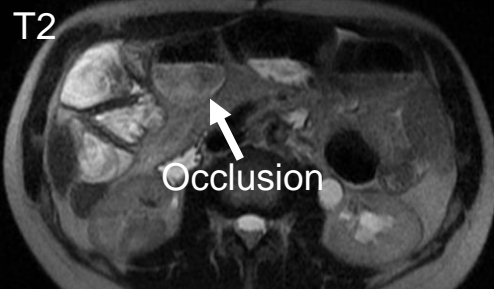


Same patient: Recidivism of the colic **adenocarcinoma with signet ring cell** in the transverse colon: intense tumor infiltration of the mucosa and submucosa corresponding of the enhancement.

Patient 5

25 years old man with CD from 11 years, PSC and liver transplantation 3 years ago. Colic **adenocarcinoma with signet ring cell component** one year ago (2005). Colectomy. Occlusion and rectitis.

MR 29/09/2006



CT 17/10/2006



Rectoscopy showed local recidive, and a stent was positioned. The occlusion was not resolved and the tumor progressed.

MRI: rectitis responsible for small bowel occlusion, resistant to medical treatment. The submucosa is in hypersignal on T2 and with important enhancement after Gadolinium IV. Important local fat infiltration and perirectal ganglia

Patient 5

Mucosa: important tumor (signet ring cells) infiltration

Submucosa: intense tumor infiltration

Muscularis: poor tumor infiltration

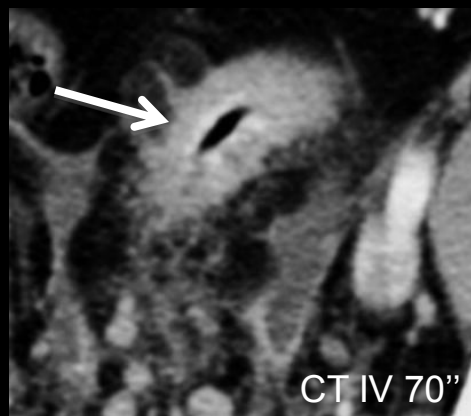
Pericolic fat: tumor infiltration

Right colon stenosis

Same patient: Adenocarcinoma with signet ring cells of the right colon T4 (scanner not available), the tumor infiltration is intense in the mucosa and submucosa.



*38 years-old man,
UC from 14 years.
Occlusion and
difficult medical
treatment.*



Rectocolitis, enhancement of the inner colic layer without ulceration. Spiculation in the pericolic fat. Ascites.

Diagnosis: severe rectitis and left-sided colitis

Surgery: tumor infiltration of colon, aorta, pelvis, peritoneal carcinomatosis.

Histology: Adenocarcinoma with signet ring cell component T4N2M1

Small bowel cancer

There were 3 patients with **CD and concomitant small bowel cancer**.

Two patients had ileocaecal affect and one had only small bowel affect.

Two SBC were in the ileum and one was in the duodenum.

2 adenocarcinomas and 1 adenocarcinoma with signet ring cell component.

All SBC presented with **occlusion** during a disease flare.

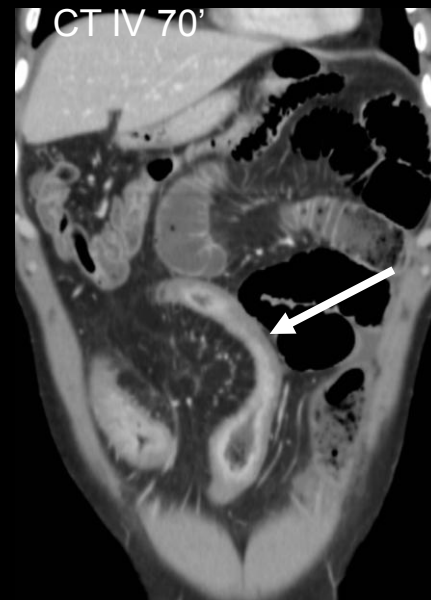
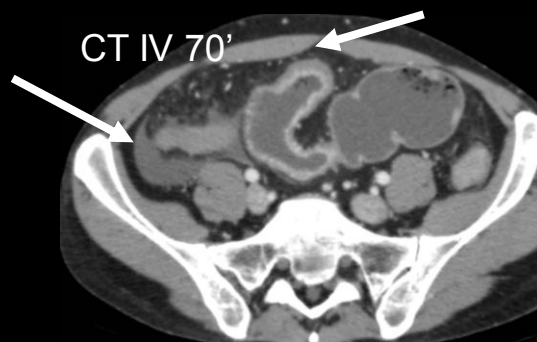
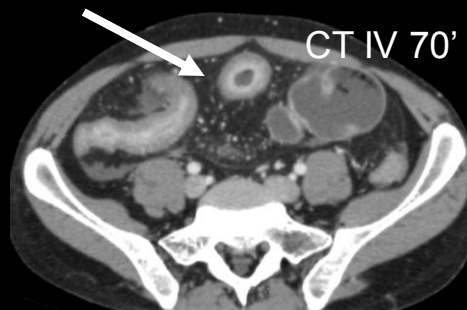
Patient 7

CT 10/01/2005



Entero CT at dignosis, CD with ileitis and inflammatory stenosis of the ileum.

CT /2008



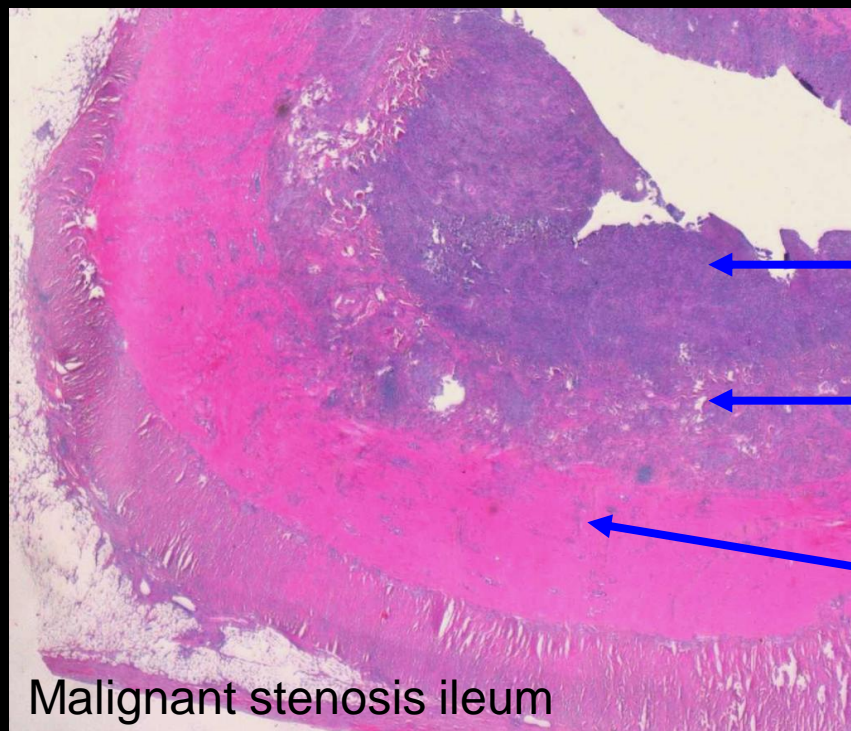
43 years old man with CD from 4 years. Small bowel chronic occlusion from 3 months resistant to all medical treatment.

CT: Small bowel occlusion with ileitis and long inflammatory stenosis. Ascites and peritoneal fat infiltration.

Patient 7

Occlusion was not resolved with medical treatment and the patient was operated: ileocaecal resection.

Diagnosis: *Focal Adenocarcinoma* with signet ring cell component of the ileum on 4 cm of length: T3 N1 M0. The tumor is not macroscopically visible. Corresponds probably to a focal thickening of the ileum stenosis.



← Mucosa: intense tumoral infiltration

← Submucosa: tumoral infiltration

← Muscularis: very poor tumoral infiltration

Malignant stenosis ileum



Ileitis

The tumor is impossible to locate in the long inflammatory stenosis

The colorectal and small bowel malignancy in IBD are well known.

We confirmed in our series the higher percentage of mucinous and signet ring cell types, the younger age at diagnosis and the relationship with the anatomic location of IBD and cancer.

Most of our patients had Crohn's Disease.

All adenocarcinomas with signet ring cells presented with **occlusion** and the pre operative imaging diagnosis was **benign inflammatory stenosis**.

We could not identify the population of IBD followed in our department: the key words « IBD », « UC » and « Crohn » given too much results.

The prevalence and the incidence were not calculated.

The diagnosis of colic or small bowel adenocarcinoma with signet ring cell component is difficult to establish only on imaging findings.

Its appearance is not usual and reminds the **stomach linitis**.

The signet ring cells infiltrate the colic or small bowel wall without any mass or asymmetric aspect.

The tumor borders were impossible to find even peroperative by surgeon because the signet ring cells do not modify the aspect of the wall.

The wall is rigid and thickened. There was intense enhancement of the inner layer mimicking an inflammatory benign stenosis.

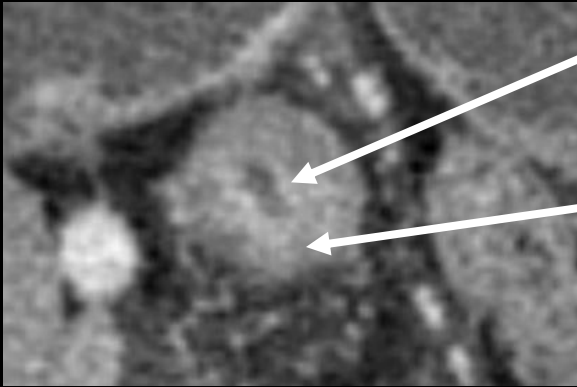
Ascitis and infiltration of peritoneal fat were frequent.



The colic or small bowel linitis in IBD are the **differential diagnosis** of colitis or ileitis.

We tried to explain these similarity by **radio-pathologic correlation** in Crohn's ileitis and small bowel adenocarcioma with signet ring cell.

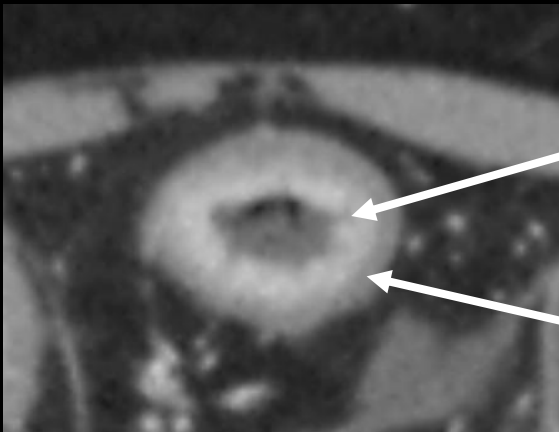
We used one patient with CD and malignant stenosis and one patient with CD and inflammatory stenosis, both with small bowel occlusion.



Mucosa: enhancement++

Submucosa and Muscularis: hypodense
important development of the muscularis in this
case: impossible de separate these layers on CT.

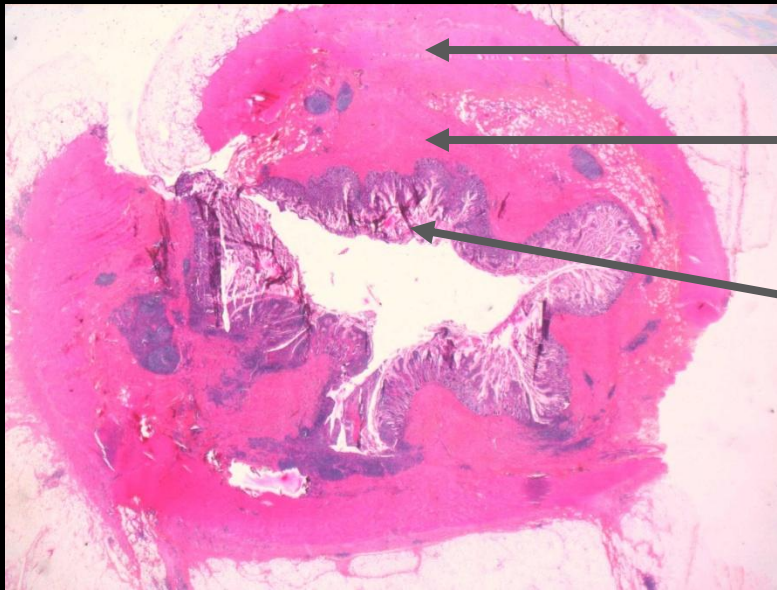
21 years old man, Crohn's disease
Operated for a *inflammatory ileum stenosis*



Mucosa and submucosa: enhancement
=important tumor infiltration

Muscularis: poor enhancement = less
important tumor infiltration

43 years old man with CD from 4 years. Small
bowel chronic occlusion from 3 months resistant
to all medical treatment. *Adenocarcinoma with
signet ring cell* component.

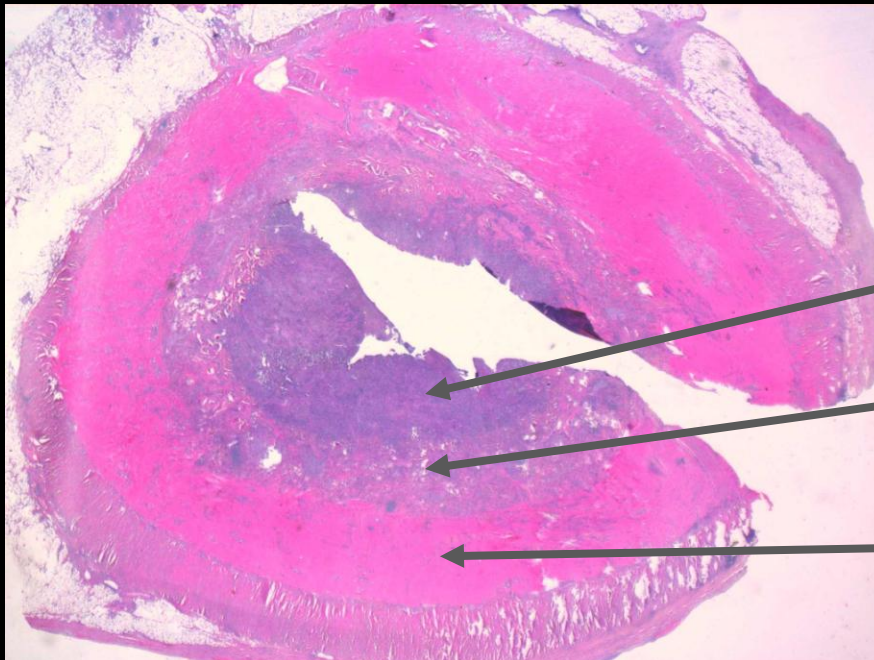


Muscularis

Submucosa: important thickening of muscularis mucosa

Mucosa

Inflammatory ileum stenosis, CD



Mucosa: intense tumor infiltration

Submucosa: tumor infiltration

Muscularis: poor tumor infiltration

Malignant stenosis, CD

Less important tumor infiltration

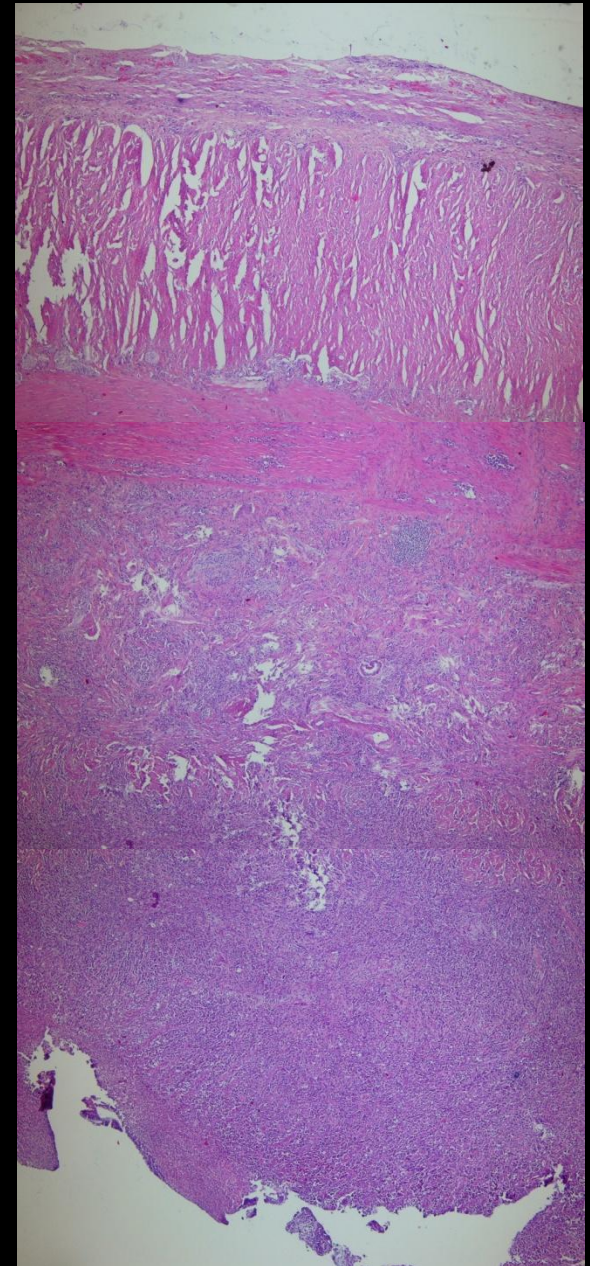
Tumor infiltration of mucosa and submucosa are accompanied with intense inflammatory infiltration and edema.

Richer vascularisation than an inflammatory Crohn's stenosis: **neo angiogenesis**

Muscularis

Submucosa

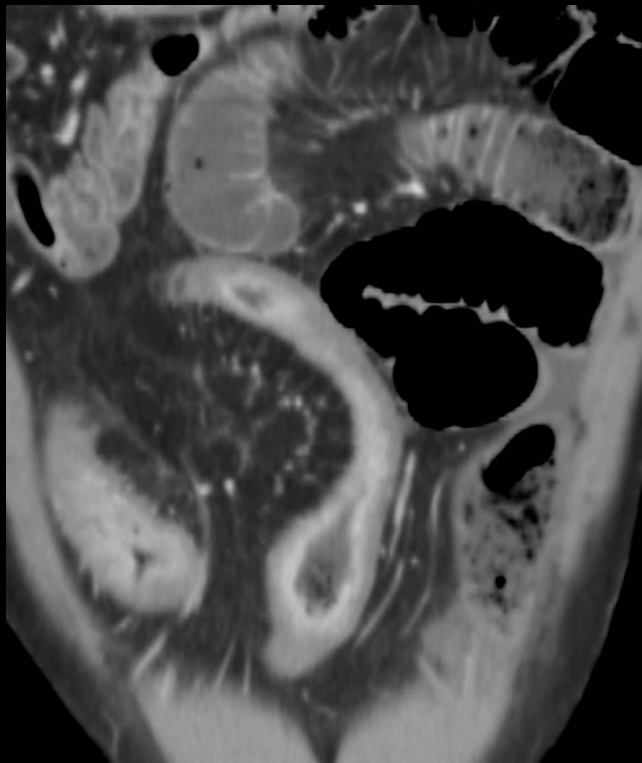
Mucosa



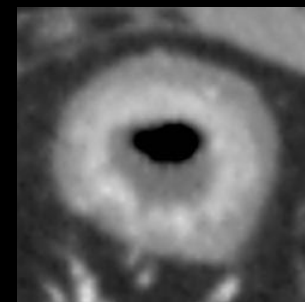
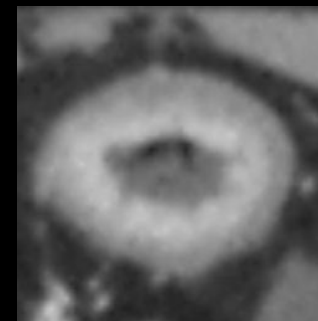
Malignant stenosis: signet ring cell, CD

The intense enhancement of the inner layer in ADC with **signet ring cells** corresponds to the tumor infiltration and NEOANGIOGENESIS.

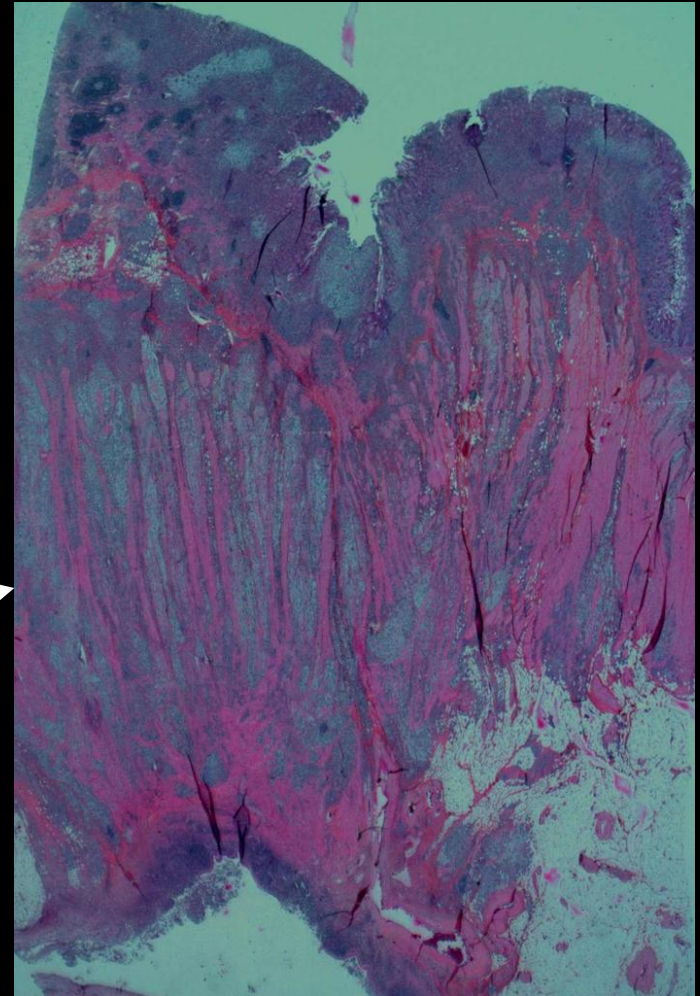
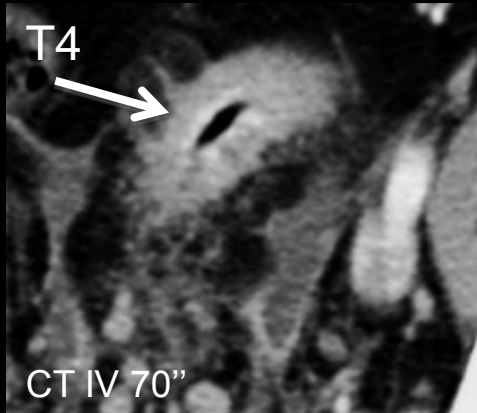
But the difference is difficult to highlight: this patient had a long inflammatory stenosis and **focal ADC with signet ring cells**: the tumor cannot be located on CT.



Stenosis on different levels in the same patient: ileitis with local adenocarcinoma



When the tumor infiltrates totally the colic wall (advanced T4) the enhancement and edema were intense without stratification.



Conclusion

The intestinal tract malignancy is a cause of death in longstanding and severe IBD.

Risk factors are well known. Most important are duration of IBD and anatomic extent.

Most of these cancers have similar imaging presentation to usual small bowel and colorectal cancers.

Large percentage (about 30%) of intestinal tract malignancy in IBD are mucinous adenocarcinoma or adenocarcinoma with signet ring component.

The adenocarcinoma with signet ring component presents as a circular symmetric stenosis and mimics a disease flare with inflammatory stenosis.

Malignant stenosis must be suspected when a patient with IBD and risk factors presents an occlusion by stenosis resistant to medical treatment.

Imaging features of ADC with signet ring cells in IBD versus inflammatory stenosis

The intense enhancement of the inner colic/small bowel layer $> 5\text{mm}$: tumor infiltration and neo angiogenesis of the mucosa and submucosa, visible on 70'' after contrast IV injection on CT.

The intense enhancement of all the colic/small bowel without stratification wall when the tumor infiltrates the muscularis: advanced T4.

Abrieiations

- IBD: inflammatory bowel disease
- CCR: colorectal cancer
- SBC: small bowel cancer
- CD: Crohn's disease
- UC: ulcerative colitis
- PSC: primary sclerosing cholangitis
- ADC: adenocarcinoma

References

1. Eaden, J.A., K.R. Abrams, and J.F. Mayberry, *The risk of colorectal cancer in ulcerative colitis: a meta-analysis*. Gut, 2001. **48**(4): p. 526-35.
2. Itzkowitz, S.H. and X. Yio, *Inflammation and cancer IV. Colorectal cancer in inflammatory bowel disease: the role of inflammation*. Am J Physiol Gastrointest Liver Physiol, 2004. **287**(1): p. G7-17.
3. von Roon, A.C., et al., *The risk of cancer in patients with Crohn's disease*. Dis Colon Rectum, 2007. **50**(6): p. 839-55.
4. Bernstein, C.N., et al., *Cancer risk in patients with inflammatory bowel disease: a population-based study*. Cancer, 2001. **91**(4): p. 854-62.
5. Jess, T., et al., *Intestinal and extra-intestinal cancer in Crohn's disease: follow-up of a population-based cohort in Copenhagen County, Denmark*. Aliment Pharmacol Ther, 2004. **19**(3): p. 287-93.
6. Itzkowitz, S.H. and D.H. Present, *Consensus conference: Colorectal cancer screening and surveillance in inflammatory bowel disease*. Inflamm Bowel Dis, 2005. **11**(3): p. 314-21.
7. Rutter, M., et al., *Severity of inflammation is a risk factor for colorectal neoplasia in ulcerative colitis*. Gastroenterology, 2004. **126**(2): p. 451-9.
8. Ekblom, A., et al., *Ulcerative colitis and colorectal cancer. A population-based study*. N Engl J Med, 1990. **323**(18): p. 1228-33.
9. Jayaram, H., J. Satsangi, and R.W. Chapman, *Increased colorectal neoplasia in chronic ulcerative colitis complicated by primary sclerosing cholangitis: fact or fiction?* Gut, 2001. **48**(3): p. 430-4.
10. Kornfeld, D., A. Ekblom, and T. Ihre, *Is there an excess risk for colorectal cancer in patients with ulcerative colitis and concomitant primary sclerosing cholangitis? A population based study*. Gut, 1997. **41**(4): p. 522-5.
11. Xie, J. and S.H. Itzkowitz, *Cancer in inflammatory bowel disease*. World J Gastroenterol, 2008. **14**(3): p. 378-89.
12. Ekblom, A., et al., *Increased risk of large-bowel cancer in Crohn's disease with colonic involvement*. Lancet, 1990. **336**(8711): p. 357-9.
13. Askling, J., et al., *Family history as a risk factor for colorectal cancer in inflammatory bowel disease*. Gastroenterology, 2001. **120**(6): p. 1356-62.
14. Pinczowski, D., et al., *Risk factors for colorectal cancer in patients with ulcerative colitis: a case-control study*. Gastroenterology, 1994. **107**(1): p. 117-20.
15. Choi, P.M. and M.P. Zelig, *Similarity of colorectal cancer in Crohn's disease and ulcerative colitis: implications for carcinogenesis and prevention*. Gut, 1994. **35**(7): p. 950-4.
16. Feldstein, R.C., S. Sood, and S. Katz, *Small bowel adenocarcinoma in Crohn's disease*. Inflamm Bowel Dis, 2008. **14**(8): p. 1154-7.
17. Palascak-Juif, V., et al., *Small bowel adenocarcinoma in patients with Crohn's disease compared with small bowel adenocarcinoma de novo*. Inflamm

*This digital poster was realised with the support of the
Society of Abdominal and Digestive Imaging of France.*



Société d'Imagerie Abdominale et Digestive